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RESEARCH ARTICLE

A COMPARATIVE STUDY OF RISK FACTORS FOR GRAFT FAILURE IN POST PENETRATING KERATOPLASTY IN TERTIARY CARE HOSPITAL

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ABSTRACT

Background and Objective: Objective of this study was to identify the risk factors for corneal graft failure and isolate microrganisms associated with graft infections after penetrating keratoplasty . The present study was conducted in the Department of Ophthalmology at tertiary care centre in central India. **Methods:** The present study was a case control study conducted in the Department of Ophthalmology at tertiary eye care from November 2018 to October 2020. Patients operated for optical penetrating keratoplasty attending eye OPD were examined. **Results:** Preoperative risk factors- adjusted risk associated with donor's age > 60 years was 8.798 with p-value 0.001, indicating significantly higher risk of graft failure as compared to donor's age < 60 years. Presence of corneal vascularity had a significantly increased adjusted risk i.e. 7.542 with a p-value 0.002, as compared to those without corneal vascularity . Perioperative risk factors: the graft size > 8.5mm has significantly higher adjusted risk of graft failure with estimate of 15.296 with a p-value of 0.013, as compared to the reference category 8.0 – 8.5mm. Postoperative risk factors: The presence of raised IOP had significantly higher adjusted risk of graft failure with estimate 10.26 with a p-value 0.011, as compared to those with normal IOP. Adjusted risk estimate corresponding to epithelial defects was 8.464 with a p-value 0.014, suggesting increased risk as compared to those without the defect. The likelihood of graft failure corresponding to graft rejection was also significantly higher as indicated by adjusted estimate of 5.688 (95% CI: 1.048 – 30.869) with a p-value 0.044, compared to those with no graft rejection. **Interpretation and conclusion: Pre-operative risk factors for graft failure**: 2 or more quadrant corneal vascularisation, peripheral anterior synechiae and older donor age (>60 years). **Peri-operative risk factors:** repeat keratoplasty and larger donor graft size >8.5mm. **Post operative risk factors:** elevated IOP, suture problem, epithelial defect, graft rejection, post penetrating keratoplasty infection were postoperative risk factors for graft failure. As per multiple logistic regression Pre-operative risk factors were Corneal vascularization and Donor age of >60 years Peri-operative risk factors were Graft size of >8.5mm Post operative risk factors were raised IOP, epithelial defect, graft rejection. Although other factors indicated increased risk in univariate analysis, evidence was statistically insignificant in multivariate analysis.

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INTRODUCTION

Corneal blindness is the major cause of visual impairment in developing world. In India there are approximately 6.8 million people who have vision less than 6/60 in at least one eye because of corneal diseases and among these 1 million people are bilaterally blind[1]. With an estimated 12.7 million people waiting for corneal transplantation, 1 in 70 of the needs are covered worldwide.

In India: According to a estimate there is addition of 25,000 to 30,000 corneal blindness cases every year[1]. Annual requirement of keratoplasty in India is 1,00,000 transplants. Annual requirement for collection is 2,00,000 corneas. Corneal blindness clearly shows that a) 80% of blind people live in the less developed world, countries where chronic economic deprivation is exacerbated by the added challenge of failing vision. b) the diseases responsible for blindness varies among developed and less developed economies. c) most causes of corneal blindness in less developed nations are either treatable or preventable.

Keratoplasty is the surgical procedure to restore vision in corneal blindness. Graft failure is defined as an irreversible loss of central graft clarity and determined clinically using a slit lamp biomicroscope (Inoue, 2001). A corneal graft failure is defined as rejected when it becomes edematous and shows signs of immunological rejection as rejection line , infiltratious keratic precipitates or anterior segment inflammation. The diagnosis of rejection is made only if transplant has remained clear for at least 2 weeks after surgery (Inoue, 2001). Risk factors for graft failure in penetrating keratoplasty are reported to be previous transplant number, h/o keratitis (bacterial, viral, fungal), persistent epithelial defects, corneal vascularization, emergency keratoplasty, duration of surgery, graft size, suture techniques, perioperative glaucoma, wound leakage, history of previous anterior segment surgery, increased donor age, young recipient age, presence of anterior synechiae of iris, blood group ABO compatibility (Inoue, 2001). This study describes risk factors for graft failure and isolate the microorganisms associated with graft infections following optical penetrating keratoplasty.

MATERIALS AND METHODS

The present study was a case control study, conducted at a tertiary care centre in central India from November 2018 to October 2020 after obtaining due ethical approval from the institutional ethics committee. Patients for this study fulfilling inclusion criteria were recruited from those attending OPD after obtaining written informed consent from the patient. Sample size for study were 36 eyes of 36 patients respectively for case and control groups. Patients who developed graft failure after a optical penetrating keratoplasty were enrolled as cases and those who had a clear graft after optical penetrating keratoplasty were included as controls in patients attending eye OPD of tertiary hospital of Central India. Detailed history of demographic parameters, history of ocular surgery, details of indications for corneal transplantation, associated systemic diseases and history of previous corneal transplantation and treatment history were elicited and electronically generated previous case records were studied.

All patients had undergone complete eye examination under slit-lamp biomicroscopy. Patients were examined for graft clarity, graft host junction, epithelial defect, number of sutures, any loose or broken sutures or exposed knots. Patients with signs of graft failure were grouped as cases and patients with clear graft were grouped as controls. Intraocular pressure was measured by Goldmann's applanation tonometer. Fundus examination was done by Indirect ophthalmoscope with 20D lens. Details of corneal donor was traced by evaluating eye bank records. In case of any suspected graft infection- corneal scrapping were obtained under 0.5% proparacaine by Kimura spatula or 15 no. blade. Routine Gram staining and potassium hydroxide (KOH) wet mount were done to examine the smears. The specimen obtained were inoculated onto blood agar, chocolate agar plates, and Sabouraud's agar tubes for culture of bacteria and fungi. In vitro disc diffusion tests were performed on culture positive cases to determine the antibiotic sensitivity profile. A positive culture was defined as growth of more than one colony of an organism in the inoculating streak of any culture medium. And these patients were treated with appropriate antifungals and antibiotics based on culture sensitivity reports.

RESULTS

Table 1 gives the distribution of patients according to age in graft failure and non-failure groups. Majorly, the patients were from 51-60 years and 61-70 years age category in both the groups. The age distribution was insignificantly different in two groups as indicated by a p-value of 0.7783. In other words, the two groups were balanced according to age. There were 20 (55.6%) males and 16 (44.4%) females in graft failure group, while 21 (58.3%) and 15 (41.7%) in non-failure group. The sex distribution was insignificantly different in two groups as indicated by a p-value of 0.999. In other words, the groups were balanced according to sex. Table 2 gives the number of patients with indications of keratoplasty (KP) in two study groups. In the graft failure category, there were maximum 10 (27.78%) cases with healed bacterial keratitis, followed by 7 (19.44%) cases of graft failure, 5 (13.89%) cases of PBK and vascular corneal opacity each. In non-failure group, maximum of 13 (36.11%) cases had PBK, followed by 7 (19.44%) cases with avascular corneal opacity, and 4 (11.11%) cases each of keratoconus and vascular corneal opacity.

Table 1. Distribution of patients according to age categories in two groups

Age category (years)	Graft failure	
	Yes	No
<=30	2 (5.6)	5 (13.9)
31-40	6 (16.7)	3 (8.3)
41-50	6 (16.7)	5 (13.9)
51-60	9 (25.0)	9 (25.0)
61-70	9 (25.0)	9 (25.0)
>=71	4 (11.1)	5 (13.9)
Total	36	36

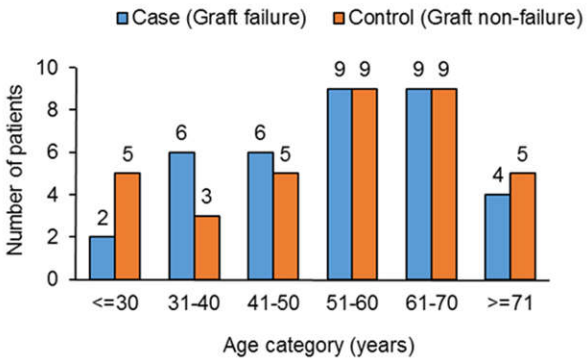

Figure 1. Column chart showing number of patients in different age categories for two groups

Table 2. Distribution of patients in two groups as per indications of Keratoplasty

Indications for Keratoplasty	Graft failure	
	Yes	No
ABK	1 (2.78)	0 (0)
Adherent leucoma	3 (8.33)	0 (0)
Avascular Corneal opacity	1 (2.78)	7 (19.44)
CHED	0 (0)	3 (8.33)
Corneal stromal dystrophy	0 (0)	3 (8.33)
Corneal dystrophy	1 (2.78)	0 (0)
Graft failure	7 (19.44)	0 (0)
Healed bacterial keratitis	10 (27.78)	2 (5.56)
Healed herpes keratitis	3 (8.33)	0 (0)
Keratoconus	0 (0)	4 (11.11)
PBK	5 (13.89)	13 (36.11)
Vascular corneal opacity	5 (13.89)	4 (11.11)
Total	36	36

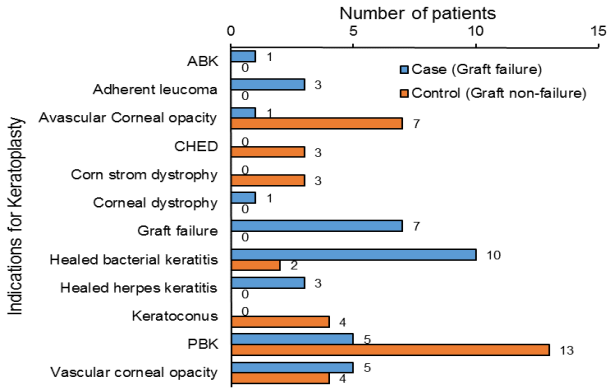

Figure 2. Horizontal bar chart showing number of patients as per indications of keratoplasty in two groups

Table 3. Distribution in two groups according to donor's age

Age category (years)	Graft failure	
	Yes	No
<=30	4 (11.1)	6 (16.7)
31-40	5 (13.9)	9 (25.0)
41-50	2 (5.6)	11 (30.6)
51-60	6 (16.7)	5 (13.9)
60-70	12 (33.3)	5 (13.9)
>=71	7 (19.4)	0
Total	36	36

Distribution of patients in two groups as per peripheral anterior synechiae: 11 (30.6%) cases of graft failure had peripheral anterior synechiae as against 3 (8.30%) cases in non-failure group. Alternatively, the odds of graft failure were 4.59 times (95% CI: 1.25 – 23.12) higher in patients with peripheral anterior synechiae as compared to those without peripheral synechiae; and the effect was statistically significant with a p-value of 0.0172. Table 3 provides the distribution of donor's according to age in two study groups. In the graft failure category, there were 17 donors with age less than 60 years, and 19 donors were above 60 years. In the non-failure group, there were 31 donors below 60 years, while only 5 were above age of 60. The odds of failure associated with > 60 years were 6.61 (95% CI: 2.19 – 23.44) with a p-value of 0.0005, indicating significant effect on the likelihood of graft failure, when donor's age exceeds 60 years. Table 4 gives the distribution of patients in two groups according to corneal vascularization in affected quadrants. In the graft failure group, 12 patients had one or no quadrants involved, while 24 had two or more quadrants involved. In the non-failure group, 29 patients had one or no quadrants, while 7 had two or more quadrant involvement. Thus, the odds of graft failure associated with two or more quadrant involvement were 7.91 (95% CI: 2.78 – 25.07) with corresponding p-value < 0.0001, suggesting significant effect of two or more quadrant involvement.

Distribution of patients in two groups as per repeat Keratoplasty: There were 7 (19.4%) cases of repeat keratoplasty in graft failure group, as compared to no case in non-failure group. The odds of failure corresponding to repeat KP were 8.4 (95% CI: 1.01 – 338.5) time more as compared to those without repeat KP; and the effect of repeat KP was statistically significant with a p-value of 0.0169.

Distribution of patients in two groups as per graft size: In the graft failure group, there were 12 (33.3%) cases with size > 8.5 mm, while 19 (52.8%) had size in the range 8.0 – 8.5 mm and 5 (13.9%) had size < 8.0.

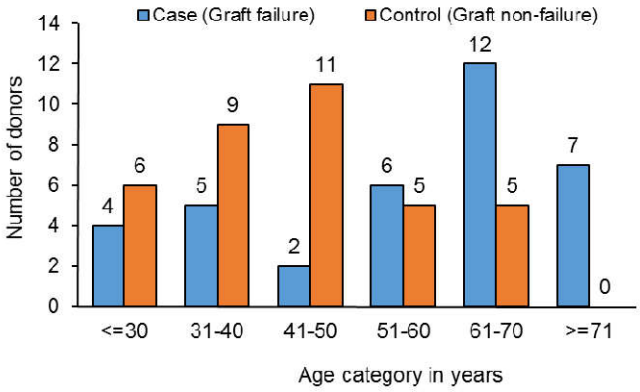

Figure 3. Column chart showing number of donors in different age categories in two groups

Table 4. Distribution of patients in two groups as per corneal vascularization

Corneal vascularization	Graft failure	
	Yes	No
0	5 (13.89)	23 (63.89)
1Quadrant	7 (19.44)	6 (16.67)
2Quadrant	8 (22.22)	6 (16.67)
3Quadrant	9 (25.0)	0 (0)
4Quadrant	7 (19.44)	1 (2.78)
Total	36	36

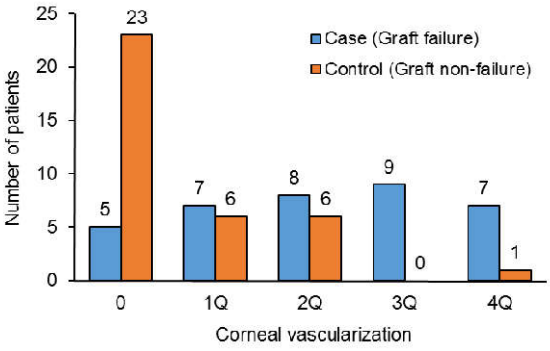

Figure 4. Column chart showing number of patients according to corneal vascularization in two groups

Table 5. Distribution of patients in two groups as per post-op raised IOP

Raised IOP	Graft failure	
	Yes	No
No	16 (44.4)	33 (91.7)
Yes	20 (55.6)	3 (8.3)
Total	36	36

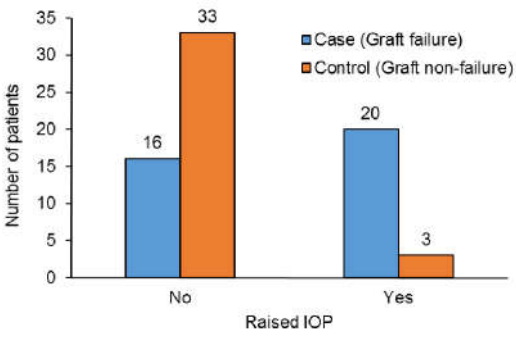

Figure 5. Column chart showing number of patients according to raised IOP in two groups

In the non-failure group, majority i.e. 33 (91.7%) had size in the range 8.0 – 8.5 mm, while 3 (8.3%) had size < 8.0 mm. Considering 8.0 – 8.5 mm as a reference category, the odds of graft failure associated with > 8.5 mm size were 19.80 (95% CI: 2.40 – 766.01) times more as compared to reference size category, which was significant with p-value < 0.0001, while odds associated with < 8.0 mm size were 2.06 (0.63 – 11.52), which was insignificant (p=0.16). Table 5 gives the number of patients with raised post-operative intra-ocular pressure (IOP) in two study groups. In the graft failure group, 20 (55.6%) had raised IOP (>21mmHg), while in non-failure category, only 3 (8.3%) had raised IOP (>21mmHg). Alternatively, the odds of graft failure associated with raised IOP were 12.75 (95% CI: 3.67 – 63.01) times higher as compared to normal IOP, and the effect of raised IOP on graft failure was statistically significant with a p-value < 0.0001.

Distribution of patients in two groups as per suture problem: There were 18 (50%) cases of such problem in graft failure group, while only 5 (13.9%) cases had the problem in non-failure group. The odds associated with suture problem were 5.93 (95% CI: 1.97 – 21.0) times more as compared to non-problematic cases, and the effect was statistically significant with a p-value of 0.0024.

Distribution of patients in two groups as per epithelial defect: In the graft failure group, there were 26 (72.2%) cases with the defect, while in non-failure group, there were 4 (11.1%) cases with the defect. The odds of graft failure associated with epithelial defect were 19.17 (95% CI: 5.83 – 80.16) times more than those without the defect, and the finding was statistically significant with a p-value < 0.0001. Table 6 gives the number of patients in two groups as per graft rejection. In the graft failure group, there were 16 (44.4%) cases with rejection, while in non-failure group, there were 3 (8.3%) cases of rejection. The odds of failure associated with graft rejection were 8.24 (95% CI: 2.35 – 40.71) times more as compared to those with no rejection, and the effect of rejection on failure was statistically significant with a p-value of 0.0013. Table 7 shows the number of patients with post penetrating keratoplasty graft infection in two groups. In the graft failure group, there were 9 (25%) cases with infection, while in non-graft failure group, there were 2 (5.6%) cases of infection. Thus, the odds of failure associated with post penetrating PK infection were 5.27 (1.20 – 40.36) times more as compared to those without infection; and the finding was statistically significant with a p-value of 0.0494. Table 8 gives the microbiological findings in the infected patients. There were 5 (45.5%) cases infected with Staphylococcus epidermidis, followed by 3 (27.3%) cases infected with Streptococcus pneumoniae and 1 (9.1%) case of Pseudomonas aeruginosa, Fusarium sp. and negative culture each.

MULTIPLE LOGISTIC REGRESSION

The adjusted risk estimates corresponding to different pre-operative, peri-operative, and post-operative factors was obtained using multiple logistic regression analysis. The analyses were performed independently for each category of risk factors. The good-ness of fit of the regression model was tested using Hosmer-Lemeshow test. Table 9 provides the adjusted risk estimates for the pre-operative, peri-operative and post-operative parameters using multiple logistic regression analysis.

Table 6. Distribution of patients in two groups as per graft rejection

Graft rejection	Graft failure	
	Yes	No
No	20 (55.6)	33 (91.7)
Yes	16 (44.4)	3 (8.3)
Total	36	36

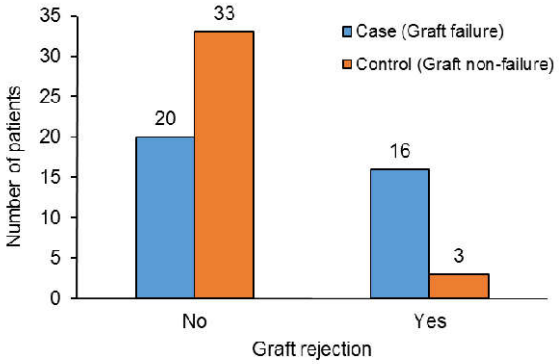

Figure 6. Column chart showing number of patients according to graft rejection in two groups

Table 7. Distribution of patients in two groups as per Post Penetrating keratoplasty graft infection

Post PK infection	Graft failure	
	Yes	No
No	27 (75.0)	34 (94.4)
Yes	9 (25.0)	2 (5.6)
Total	36	36

Table 8. Number of patients according to type of organism

Organism	No. (%)
Staphylococcus epidermidis	5 (45.5)
Streptococcus pneumoniae	3 (27.3)
Pseudomonas aeruginosa	1 (9.1)
Fusarium sp.	1 (9.1)
Negative culture	1 (9.1)
Total	11

Pre-op risk factors: The Hosmer-Lemeshow test resulted into a p-value of 0.966 suggesting a good fit of the model. Table reveals that adjusted OR associated with donor's age > 60 years was 8.798 (95% CI: 2.320 – 33.363) with p-value 0.001, indicating significantly higher risk of graft failure as compared to donor's age < 60 years. Further, presence of corneal vascularity had a significantly increased adjusted risk i.e. 7.542 (95% CI: 2.146, 26.509) with a p-value 0.002, as compared to those without corneal vascularity.

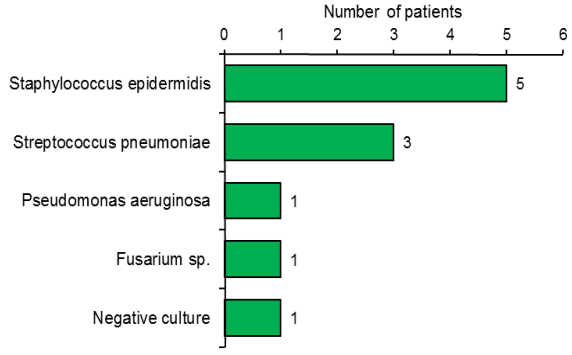

Figure 8. Horizontal bar chart showing number of patients infected with different organisms

Table 9

Pre-op risk factors	Adjusted OR	95% CI for OR	P-value
Posterior synechiae (Yes)	1.037	0.104, 10.372	0.975
Peripheral anterior synechiae (Yes)	4.841	0.871, 26.891	0.071
Donor's age (> 60 years)	8.798	2.320, 33.363	0.001
Corneal vascularity (Yes)	7.542	2.146, 26.509	0.002
Peri-op risk factors	Adjusted OR	95% CI for OR	P-value
Triple procedure (Yes)	2.110	0.416, 10.708	0.368
Repeat keratoplasty (Yes)	4.910	0.463, 52.054	0.186
Graft size (Ref: 8.0 – 8.5mm)			0.026
< 8.0 mm	2.817	0.585, 13.552	0.196
> 8.5 mm	15.296	1.768, 132.295	0.013
Post-op risk Factors	Adjusted OR	95% CI for OR	P-value
Raised IOP (Yes)	10.260	1.722, 61.119	0.011
Epithelial defect (Yes)	8.464	1.550, 46.225	0.014
Suture problem (Yes)	2.155	0.392, 11.852	0.377
Graft rejection (Yes)	5.688	1.048, 30.869	0.044
Post PK infection (Yes)	1.021	0.083, 12.589	0.987
Post-op surgery (Yes)	11.257	0.645, 196.475	0.097

Bold p-values indicate statistical significance

Peri-op risk factors: The Hosmer-Lemeshow test resulted into a p-value of 0.271 suggesting a good fit of the model. Table reveals that the graft size > 8.5mm has a significantly higher adjusted risk of graft failure with estimate of 15.296 (95% CI: 1.768, 132.295) with a p-value of 0.013, as compared to the reference category 8.0 – 8.5mm. The presence of other factors had also increased adjusted risks of graft failure, but were statistically insignificant.

Post-op risk factors: The Hosmer-Lemeshow test resulted into a p-value of 0.11 suggesting a good fit of the model. The presence of raised IOP had significantly higher adjusted risk of graft failure with estimate 10.26 (95% CI: 1.722 – 61.119) with a p-value 0.011, as compared to those with normal IOP. Further, the adjusted risk estimate corresponding to epithelial defects was 8.464 (95% CI: 1.550 – 46.225) with a p-value 0.014, suggesting increased risk as compared to those without the defect. The likelihood of graft failure corresponding to graft rejection was also significantly higher as indicated by adjusted estimate of 5.688 (95% CI: 1.048 – 30.869) with a p-value 0.044, compared to those with no graft rejection. The other factors also had increased risk of graft failure, but statistically insignificant.

DISCUSSION

This is a case control study done in patients who had undergone optical penetrating keratoplasty attending eye OPD of tertiary hospital. The risk factors for graft failure after penetrating keratoplasty and microorganisms associated with post penetrating keratoplasty graft infection were studied. Other studies were also consistent with present study.

PREOPERTAIVE RISK FACTORS

In a study done by Inoue et al., estimated relative risk of graft failure in vascular cornea were 2.03 (2 quadrants) and 2.65 (3 or more quadrants), p value was 0.0006 which was significant. Estimated relative risk of graft failure in presence of anterior synechiae were 2.91 with significant p value of <0.0001 and posterior synechiae 2.56 with significant p value of <0.0001. Thus higher relative risk of graft failure was associated with corneal vascularization, presence of anterior and posterior synechiae (Inoue, 2001).

Preoperative corneal vascularization has been already reported with increased incidence of graft failure in various other studies (Williams, 1992; Boisjoly, 1990; Price, 1993; Maguire, 1994; Yamagami, 1996). Our study showed odds of graft failure associated with 2 or more quadrant corneal vascularization was 7.91 (95% CI 2.78-25.07) with corresponding significant p-value <0.0001. Odds of graft failure were 4.59 times (95% CI 1.25-23.12) higher in patients with peripheral anterior synechiae and the effect was statistically significant with a p-value of 0.0172. The odds of graft failure associated with posterior synechiae were 2.60 (95% CI 0.49-21.37) times more as compared to absence of posterior synechiae, however, the effect of presence on failure was statistically insignificant (p-value- 0.2327). The odds of failure associated with >60 years were 6.61 (95% CI 2.19-23.44) with a significant p- value 0.0005. Thus we found 2 or more quadrant corneal vascularization, peripheral anterior synechiae and older donor age (>60 years) as pre-operative risk factors for graft failure. In our study we found healed bacterial keratitis, preoperative graft failure, vascular corneal opacity of unknown origin, healed herpes keratitis and adherent leucoma had increased risk of graft failure. Keratoconus, congenital hereditary endothelial dystrophy, corneal stromal dysrophy, avascular corneal opacity, pseudophakic bullous keratopathy had less risk of graft failure.

PERIOPEARTIVE RISK FACTORS

In various other studies repeat keratoplasty was significantly associated with graft failure[9,10]. Our study also had similar results with significant risk of graft failure with repeat keratoplasty , the odds of failure corresponding to repeat PK were 8.4 times more as compared to those without repeat PK (p-value 0.0169) and larger donor graft size of >8.5mm, the odds of graft failure associated with >8.5mm were 19.80 times more as compared to reference size category (p-value <0.0001). Odds associated with triple procedure were 1.729 but has statistically insignificant p-value 0.453. Thus repeat keratoplasty and larger donor graft size were perioperative risk factors for graft failure.

POSTOPERATIVR RISK FACTORS: Alice L yu et al. study revealed that elevated intra-ocular pressure (p value <0.001), wound leakage (p value <0.001), suture problems (p value- <0.001), persistent epithelial defect (p value <0.001) ,

infectious or herpes keratitis (p value < 0.001) and graft rejection (p value <0.001) with statistically significant p-value as postoperative risk factors for graft failure[3]. In our study we found elevated intra-ocular pressure (odds ratio - 12.75, p value- <0.0001), suture problem (odds ratio- 5.93, p value- 0.0024), epithelial defect (odds ratio- 19.17, p value- <0.0001), graft rejection (odds ratio 0 8.24, p value- 0.0013), Post PK infection (odds ratio- 5.27, p value- 0.0494) were postoperative risk factors for graft failure with statistically significant p-value. The odds of graft failure associated with post op surgery (post Penetrating Keratoplasty cataract surgery) were 3.18 times more than no post-op surgery but was statistically insignificant (p= 0.2382). In a study done by R B Vajpayee et al. Staphylococcus epidermidis (55.8%) was the most common organism isolated followed by Staphylococcus auerus, Acinetobacter species, Aspergillus fumigatus, Fusarium solanei and Pseudomonas aeurginosa in decreasing order[11]. In various other studies, the predominant pathogens were gram positive cocci and gram negative bacilli; among these, the streptococcal species were the most common. In our study Staphylococcus epidermidis (45.5%) was the most common organism responsible for post-keratoplasty microbial keratitis followed by Streptococcus pneumoniae (27.3%), Pseudomonas aeuriginosa (9.1%), Fusarium (9.1%), we had 1 negative culture even when repeated twice.

As per multiple logistic regression

Pre- operative risk factors were Corneal vascularization (p= 0.002) and Donor age of >60 years (p= 0.001)

Peri-operative risk factors were Graft size of >8.5mm (p= 0.013)

Post operative risk factors were raised IOP (p= 0.011), epithelial defect (p=0.014), graft rejection (p=0.044). Although other factors indicated increased risk in univariate analysis, the evidence was statistically insignificant in multivariate analysis. Secondary glaucoma was the most common cause for graft failure in our study. Pre and post operative diagnosis of glaucoma and its management, a good preoperative evaluation, regular follow-up, timely diagnosis and management of raised IOP will have good prognosis. Graft rejection was the 2nd most common cause of graft failure with risk factors being a) vascularization (superficial / deep), b) improper usage of drugs and irregular follow up. Early detection and timely proper management of graft rejection has very good prognosis. Persistent epithelial defect may lead to anterior stromal opacification, stromal melting, secondary infection, suture loosening, vascularization, and reduced graft survival. Careful attention to preservation of the donor epithelium at the time of graft surgery helps to maintain the donor epithelium in the early postoperative period. Good wound apposition and prevention of an overriding edge leads to better tear film distribution and a reduced incidence of epithelial defects. Good donor cornea selection where hospital based corneal retrieval programme plays a vital role in procuring young donor corneas. Graft infection is also a cause of graft failure, the risk factor for graft infection are recurrence of the disease, surface problems and suture related problems. Epithelial defect, suture problems like exposed knots, loose sutures should be managed at the earliest, send for available microbiological investigations, appropriate medical management and prophylactic antiviral therapy for corneal scars due to viral infections will increase the graft survival rate. Suture related problems such as loose suture, sterile infiltrates, secondary infections may complicate the postoperative course of keratoplasty. Loose sutures, exposed suture knots, broken suture ends tend to allow for mucus accumulation and invasion of microorganisms thereby acting as nidus for colonization of pathogens. As these serve to predispose to the occurrence of post-keratoplasty graft infections, emphasis should be placed on prompt removal of loose sutures, exposed knots or broken sutures. Suture induced corneal erosions when the sutures persist for a longer period of time, are more prone to get infected. Hence the importance of prompt removal of these problem sutures is mandatory. It is routinely recommended to administer a short course of topical antibiotics after suture removal to reduce the risk of introduction of microorganisms during suture removal.

CONCLUSION

Corneal transplant surgery is the most commonly performed allograft and is said to be the most successful solid organ transplant. Reports from various graft registries of the developed world shows the indications for surgery being mainly keratoconus, other corneal dystrophies followed by bullous keratopathy. However the scenario in developing world is different. Firstly, patient profile and indications for surgery differ and majority of our patients are illiterate with poor socio economic status, so postoperative care and follow up is a major challenge. The study of the causes of graft failure is important for establishing appropriate preoperative and postoperative measures and providing the patient's family with more reliable information in relation to the prognosis of the case. Hence, the purpose of this study is to know the causes and risk factors for graft failure and to isolate organisms associated with graft infection. Prognosis and the outcome depends on how the risk factor predisposing to graft failure is prevented or managed. In our study we found healed bacterial keratitis, preoperative graft failure, vascular corneal opacity of unknown origin, healed herpes keratitis and adherent leucoma had increased risk of graft failure. Keratoconus, congenital hereditary endothelial dystrophy, corneal stromal dystrophy, avascular corneal opacity, pseudophakic bullous keratopathy had less risk of graft failure.

Pre-operative risk factors: 2 or more quadrant corneal vascularisation, peripheral anterior synechiae and older donor age (>60 years)

Peri-operative risk factors: repeat keratoplasty and larger donor graft size >8.5mm.

Post operative risk factors: elevated intra-ocular pressure, suture problem, epithelial defect, graft rejection, post penetrating keratoplasty infection were postoperative risk factors for graft failure. In our study Staphylococcus epidermidis (45.5%) is the most common organism responsible for post-keratoplasty microbial keratitis followed by Streptococcus pneumoniae (27.3%), Pseudomonas aeuriginosa (9.1%), Fusarium sp. (9.1%).

As per multiple logistic regression: Pre- operative risk factors were Corneal vascularization and Donor age of >60 years Peri-operative risk factors were Graft size of >8.5mm Post operative risk factors were raised IOP, epithelial defect, graft rejection.

Although other factors indicated increased risk in univariate analysis, the evidence was statistically insignificant in multivariate analysis. Regular follow-up, proper usage of drugs, good donor cornea selection where hospital based corneal retrieval programme plays a vital role in procuring young donor corneas, early detection, timely management of the factors predisposing the graft failure will improve the graft survival rate and the outcome. Prospective study with larger study population and longer follow ups will yield more accurate results in terms of risk factors for corneal graft failure. Endothelial cell density in donor cornea is one of the important factor which influences the outcome after corneal transplantation which was not included in our study and is the limiting factor.

Conflict of interest: Nil

ABBREVIATIONS

ABK- Aphakic bullous keraopathy
CHED- Congenital hereditary endothelial dystrophy
IOP- Intraocular pressure
OPD- Outpatient department
PBK- Pseudophakic bullous keratopathy
PK- Penetrating keratoplasty

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